

1. (Previously presented) A tower reactor comprising reaction zones for simultaneous esterification and/or transesterification and also precondensation, the individual reaction zones being connected to each other and combined in the tower reactor, wherein the at least one tower reactor is constructed as follows: in the upper third, the tower reactor is configured in the form of a hydrocyclone with attached heat exchanger and has a supply line for the paste, suspension and/or liquid raw material mixture, the region of the tower reactor below the hydrocyclone is configured in the form of a downflow cascade, the cascade is via a pipe in connection with the lower part of the tower reactor which is configured in the form of a single- or multiple-stage falling-film zone with a preliminary pressure reduction.

2. (Previously presented) The tower reactor according to claim 1 wherein the hydrocyclone has a vapor connection piece and is connected to a heat exchanger in such a manner that the product is directable in the natural or enforced circulation via the heat exchanger into the hydrocyclone.

3. (Previously presented) The tower reactor according to claim 1 wherein the heat exchanger has a separate gas chimney which leads into an upper part of the cyclone.

4. (Previously presented) The tower reactor according to claim 1 wherein the cascade has at least two trays.

5. (Previously presented) The tower reactor according to claim 4 wherein a stirring assembly for mixing additives is in at least one cascade region.

6. (Previously presented) The tower reactor according to claim 4 wherein the penultimate cascade has a discharge pipe on which an injection lance for the supply of additives is disposed.

7. (Previously presented) The tower reactor according to claim 1 wherein the pressure pipe is configured as a double-walled jacket pipe which is continued in the interior of the first top cascade as a heating coil.

8. (Previously presented) The tower reactor according to claim 1 wherein the pressure pipe is equipped with a volume conveyor and static mixing elements or with a mixing pump.

9. (Previously presented) The tower reactor according to claim 1 wherein the hydrocyclone has a gas inlet in a conical region thereof.

10. (Previously presented) The tower reactor according to claim 1 wherein one of the reaction trays in the vapor region has an inert gas inlet.

11. (Previously presented) The tower reactor according to claim 1 wherein the preliminary pressure reduction zone for the falling-film part has the form of a hydrocyclone.
12. (Previously presented) The tower reactor according to claim 1 wherein the preliminary pressure reduction zone is equipped with at least one further pressure reduction chamber.
13. (Previously presented) The tower reactor according to claim 1 wherein the at least one falling-film zone has a pipe field.
14. (Previously presented) The tower reactor according to claim 1 wherein an inlet cylinder is assigned to each pipe of the pipe fields and ensures uniform wetting of the insides of the pipes, the pipes being equipped with overlapping, non-axial slots on the circumference, a constant filling level above the series of pipes being producible because of the slot pressure loss, and having a maximum overflow with an indented crown, the slots being configured such that viscosity differences effect no change in the filling level, but a proportional change of filling level to liquid throughput.
15. (Previously presented) The tower reactor according to claim 13 wherein the pipe field has channels for distribution of the melt.
16. (Previously presented) The tower reactor according to claim 13 wherein the pipes have a cold-rolled, drawn surface “m” according to EN ISO 1127 with a surface roughness $R_a = 0.4$ to 0.6 or R_t 4 to $6 \mu\text{m}$.
17. (Previously presented) The tower reactor according to claim 13 wherein the pipe bases are configured in the form of a cap.
18. (Previously presented) The tower reactor according to claim 13 wherein the length of the pipes of the falling-film zone is dimensioned such and the inner surfaces have such a structure that total wetting is effected as a function of the product viscosity ($L:D \geq 10 \leq 25$).
19. (Previously presented) The tower reactor according to claim 13 wherein the diameter of the pipes of the falling-film zone is chosen to be larger than the largest occurring reaction vapor bubble and in that the reaction vapors are directed in parallel flow with the downwardly flowing product.
20. (Previously presented) The tower reactor according to claim 1 wherein the tower reactor has dipped supply lines for the reaction gases and/or foreign gas from reaction tray to reaction tray for conducting in parallel flow through the reaction liquid

in order to produce a pressure incline between each tray.

21. (Previously presented) The tower reactor according to claim 1 wherein the entire tower reactor is equipped with a jacket for heating with organic heating medium in vapor form.

22. (Previously presented) The tower reactor according to claim 1 wherein all the heat exchange surfaces in the individual zones are equipped for liquid heat carriers for process-relevant temperature- and heat quantity distribution.

23. (Previously presented) The tower reactor according to claim 1 wherein the tower reactor has a plate base valve with flow-directing formation with which the supply of the raw materials is effected centrally from below.

24. (Previously presented) The tower reactor according to claim 1 wherein the heat exchanger has static mixing elements in order to improve mixing of the raw mixture into the reaction mixture.

25. (Previously presented) The tower reactor according to claim 1 wherein the heat exchanger has a three-dimensional static mixing element for producing diagonal cross-flows with simultaneous axial through-flow.

26. (Previously presented) The tower reactor according to claim 25 wherein the three-dimensional static mixing element has cross-wise and diagonally configured sheet metal sections with carrier and retaining frames in the flow direction.

27. (Previously presented) The tower reactor according to claim 26 wherein the sheet metal sections are at least one of perforated, undulating, folded and pleated.

28. (Previously presented) The tower reactor according to claim 1 wherein the heat exchanger has a heating chamber and a product chamber and also at least one separating device for horizontal separation of heating chamber and product chamber, the height of the separating device corresponding at least to the diameter of the heat exchanger pipes and the separated heat exchanger regions having a rotated offset which corresponds at most to the diameter of the heat exchanger pipes.

29. (Previously presented) The tower reactor according to claim 28 wherein the individual separated heat exchanger regions have a different pipe division.

30. (Currently amended) The tower reactor according to claim 1 wherein the hydrocyclone includes one or more vapor chambers, and the vapor chambers are coated in an adhesion-reducing manner.

31. (Currently amended) ~~Use of the device according to claim 1~~ A method for continuous production of high-molecular weight polyesters by at least one of

esterification of dicarboxylic acids and ~~for~~ transesterification of dicarboxylic acid esters with diols in the presence of catalysts with formation of a prepolymer and polycondensation thereof to form high-molecular weight polyester, the method comprising providing a tower reactor comprising reaction zones for at least one of simultaneous esterification and precondensation and simultaneous transesterification and precondensation, the individual reaction zones being connected to each other and combined in the tower reactor, constructing the tower reactor as follows: configuring the upper third of the tower reactor in the form of a hydrocyclone with an attached heat exchanger and a supply line for at least one of a paste raw material mixture, a suspension raw material mixture and a liquid raw material mixture, configuring the region of the tower reactor below the hydrocyclone in the form of a downflow cascade, the cascade is via a pipe in connection with the lower part of the tower reactor, and configuring the lower part of the tower reactor in the form of one of a single-stage falling-film zone with a preliminary pressure reduction and a multiple-stage falling-film zone with a preliminary pressure reduction.